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ABSTRACT

The influences of the study of legibility on newspapers are outlined, and some of the consequences of applying science to the visual design of journalism are considered. The science of legibility began by measuring how letters were perceived, and comparing how different designs are read. The legacy of legibility research, which is traced over the years, has been to document several general observations about typography that have been generally accepted, even though the specifications of legibility science fall short as a practical guide. Some of the changes in newspaper type size result not only from legibility science, but also from the style of the times. In general, newspapers have become more legible and more aesthetically designed because of changes in type. Legibility and other principles are widely used in the field of visual literacy, but it must be recognized that compromising legibility and beauty can at times serve a greater number of readers and allow more diversity of content. (Contains 19 references.) (SLD)

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ED 363 284

Legibility Science and the Visual Design of Newspapers

by
Kevin G. Barnhurst

Until the nineteenth century, the knowledge of how type could most effectively convey meaning was based on the traditions of the craft. Through centuries of experiment, practitioners accumulated an understanding of what made type legible. This knowledge was embedded in the practices handed down from master to apprentice for generations. Industrial changes and the demise of the master-apprentice system in the nineteenth century threatened the legacy of the past and debased this traditional typographic wisdom. One aim of the revivalist mentality of the late nineteenth and early twentieth centuries was the restoration of typographic knowledge.

The process took a particular turn at newspapers, where journalists looked to science and scientific inquiry to guide their decisions. Newspaper design was more amenable to scientific control than other publication genres have been, for reasons that derive from the practices and institutions of journalism. Newspaper editors and reporters engage in a search for factual truth that has affinities with the goals of empirical science. The economic pressures of manufacturing a product daily or weekly also encouraged a commitment to science, which was considered more efficient than the slow accretion of traditional knowledge.

The influence of scientific thinking on newspapers took many forms, but one field has been the most influential. Designers have used the science of legibility to push for larger body typography, simplified headlines, and wider, horizontal layout — the principal components of modern newspaper design. This paper outlines the influences of legibility on newspapers and suggests some of the consequences of applying science to the visual design of journalism.

THE RISE OF LEGIBILITY SCIENCE

The science of legibility began by measuring how letters were perceived and comparing how different designs were read. (The former measure is called *legibility*, the latter *readability*, but the two terms are used interchangeably here.) In 1926, R. L. Pyke published a *Report on the Legibility of Print*, which initiated a program of scientific experiments. Pyke began by surveying contradictory results

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from the scattered investigations of printers, advertisers, publishers, psychologists, ophthalmologists, and physiologists of the previous century.

These studies of legibility began in the the 1790s, when the French Imprimerie Nationale asked a panel of expert judges to read type samples at various distances to compare the new modern typeface of Didot with the old style Garamond, which was found to be readable at a greater range of distances. In the 1820s Charles Babbage reported that the aligning figures were more legible for scientific instruments than the numbers with ascenders and descenders. Both of these conclusions were contradicted by later research. Beginning in 1878, Emile Javal's controlled experiments revealed that the reading eye moves in a series of jumps across the page (he called these *saccadic* movements) and that the upper half is more legible than the lower half of letters. From these results, Javal proposed that typefaces be redesigned without descenders.

A current reading of Pyke's exhaustive survey of early experiments reveals several patterns: Legibility research may tend to increase during periods of typographic change, when an older style is under assault. Although the goal of the research is usually to find essential truth, the results tend to reflect the customs and practices of the time, familiar to the investigators and study participants. In the French experiment, for example, the experts who found Didot less readable were typographers trained to use Garamond. Legibility study grew over the course of the nineteenth and twentieth centuries, to match the frenzied pace of stylistic change, which was encouraged by changes in technology and industry.

Another pattern apparent in Pyke's report is that early results often get contradicted by later studies, not only as measurements become more sophisticated but also as customs change. Only in the realm of physiological measurements, such as saccadic movements, do concrete observations remain relatively unchanged, but these are without many practical uses in typographic design or selection. For example, no one has taken seriously Javal's proposals to shear off the bottoms of letters.

From his own experiments, Pyke found that only extremely large differences in type produced any differences in legibility. He concluded that readers find most legible whatever type they are accustomed to and that the measurement of "objective legibility must be almost impossible" (Pyke 60). Despite the difficulty, he combed his own and others' research to find this universal standard: the ideal letters for reading body text should be fairly simple, broad, and thick, without extreme contrast. His description seems to suggest that the average, middling, and least distinctive faces are the most legible.

The typographer Ben Sherbow at the *New York Tribune*, John E. Allen, editor of the *Linotype News*, and their followers in American journalism responded enthusiastically to the new science of legibility, which inspired at least a dozen typefaces specifically created for newspapers (Spencer). What the so-called legibility types designed by twentieth-century type founders have in common is the fairly broad, thick letters and unexaggerated contrast recommended by Pyke. The Mergenthaler Linotype Co. introduced the first of the group, Ionic, in 1926, based on an Egyptian of the Clarendon design.

Three more faces — Excelsior, Opticon, and Paragon — were released in the 1930s, followed in 1941 by Corona, the body face recently in use at roughly half of all newspapers. Linotype's chief competitor, Intertype, issued Ideal in 1928 (in response to Ionic), followed in 1935 by Regal, the typeface designed for the *Chicago Tribune*, and then by Rex, created for the *Milwaukee Journal* in 1939. A 1957 design, Imperial, was adopted in 1967 by the *New York Times*, and a fifth Intertype "legibility" face, Royal, was introduced in 1960 (to compete with Linotype's Corona). These faces all fall within the later transitional school (Lawson).

One of the "legibility" typefaces, Linotype Excelsior, superimposed on an earlier standard newspaper typeface, Roman No. 2, shown in outline. From Alexander S. Lawson. Anatomy of a Typeface *(Boston: Godine, 1990), 280.*

Throughout the century, Pyke's successors continued to refine the method of measuring legibility (Zachrisson). Their definitions and methods were usually behaviorist and relied on electrical equipment (such as the tachistoscope, an apparatus that measures perception and speed by exposing words for short, precise periods of time), but they disagreed over what to measure. In the thirties and forties, Matthew Luckiesh advocated a method that counted blinking as a sign of reading discomfort. His studies were attacked by fellow scientists such as Donald Patterson and Miles Tinker of the University of Minnesota, who preferred to record reading speed.

Both methods contributed to the emerging profile of the behavior of the average eye. By the 1960s, researchers had measured the average rate of reading (250 to 300 words per minute), the average reading distance (12–14 inches), the average range of focus (4 letters in the central area in sharpest focus, called the *fovea*, and 8–11 in the peripheral zone), and other measures such as the average fixation pause between saccadic movements and the average rate of regressions (jumping back before continuing ahead), as well as the effects of content, light, paper, and typography on these averages.

The legacy of legibility research has been to document several general observations about typography, many of them long understood within the craft: Capital letters and italics are harder to read than plain small letters. Darker or bolder letters are usually easier to read. Tinted backgrounds have a negligible effect on reading. Dark letters on light paper are easier to read than light letters of the same size reversed from a dark background. Extremely long or short lines of type slow reading by requiring more regression movements or fixation pauses. And justified type (aligned on both sides) is no more legible than ragged or unjustified type (summarized by Rehe).

Unlike craft-based knowledge, these research findings too often acquire the status of immutable laws. But they cannot succeed as design caveats for two reasons. First, the results come from controlled environments that have little relation to the real-world practice of reading. By changing the lighting, the position of reading, and the angle of the paper, readers exert as much control over legibility as any factor researchers measure. The studies not only fail to allow for variable reading conditions, they also do not measure the levels of reader motivation. Although few use a magnifying glass, investors, sports fans, bargain hunters, and others equally committed to specific content routinely read type that breaks all putative laws of legibility. Controlled experiments also ignore the social interactions and ordinary distractions that may impinge on the reader's commitment.

Second, the results aspire to essential truths or universal standards for what in fact are mutable, social practices. At best the rules indicate what is common, popular, and familiar at a given moment in the sweep of stylistic change. But the authority of science introduces a rigidity, a resistance to innovation. As a tool for marketing products to specific audiences, legibility rules may contribute to a predictable standardization. Guided by their knowledge of the craft, designers routinely break rules, pushing the limits to establish new styles. The small type, tightly letter spaced on the long, widely spaced lines now in fashion may not have been scientifically legible when first introduced, but it could soon become so.

Some Consequences of Legibility Research

Legibility researchers have often produced specific results showing that one school or face is superior to another. Just as old style was once found to be more readable than modern, both were recently considered more readable than sans serif. These results usually don't hold up as styles change. Some researchers have tried to avoid the uncertainty of shifting styles by searching for firm ground in an optimum set of specifications. For example, Patterson and Tinker said the ideal book should among other things be set in 11-point type. In 1963, Tinker recommended longer lines (that is, wider columns), more leading between lines, and 8- or 9-point type sizes for newspapers.

Even these general ideals show how little legibility science has understood either the measurement of type or the meaning of the typographic craft. The visual sizes of different typefaces can vary greatly for the same point size. A better gauge of type size might be the height of the lowercase letters exclusive of ascenders and descenders, most easily seen in the small *x*. A large x-height makes 9-point Helvetica dramatically larger to the eye than 9-point Garamond, which has a smaller x-height with long ascenders and descenders. Such variance makes size specifications of legibility research only vaguely meaningful. No standard unit of x-height has ever been established, and even if it were, the variable length of ascenders and descenders would render it of little practical value.

Although the specifications of legibility science fall short as a practical guide,

the research did document the changes in newspaper text sizes (Tinker). Late nineteenth-century newspapers commonly used 6-point body type. Although the first "legibility" type was nominally 6-1/2 point, the recommendations of research produced an x-height closer to a typical 8-point type, so that fewer letters fit on the line than the half-point change seemed to imply. By the 1930s, 7-point body had become common, and, in part because of legibility science, 8- and 8-1/2-point were standard by the late 1950s. Recently twice as many newspapers were using 9-point as 8-1/2-point type. Because of the size of the x-height, these types continue to appear larger than their nominal sizes might imply.

The consequences of these changes were more than cosmetic; they had profound implications for journalism (Barnhurst 1991). From 1885 to 1985, the number of words that would fit on the typical front page fell from 12,000 to 4400 (Barnhurst and Nerone). The number of pages in the newspaper increased, but so did the amount of space used for pictures, headlines, and everything but body text. It is safe to say that a great deal of what once could fit on the front page had to move inside, ended up unpublished as overset type, or never got reported at all.

The role of legibility research in this process is clear. Researchers tested reading speed to find the optimum typeface, size, line length, and leading. These objective measures generally coincided with the stated preferences of the study participants. All else being equal, they opined, larger sizes and wider columns with more leading make for faster, more comfortable reading. But all else was not and cannot be equal. A spacious, large-type newspaper must exclude something. All readers might want whatever catches their particular interest displayed that way, as long as somebody else's interest gets pushed aside, off the front pages or out of the newspaper entirely.

Reduced coverage on the front page, where it matters, narrows the audience whose particular interests can be covered there and reduces the chances for creating new interests. As newspapers seek to attract more readers, the use of large type becomes a structural barrier to diversity. Although it might be slower to read, a tighter front page can serve a more diverse audience and reward minority cov-erage. As readers find more groups treated prominently, including their own, they might identify more strongly with the newspaper. In other words, a moderate reduction in conventional legibility could in fact increase readership. And even if it failed to do so, the change would signal the newspaper's commitment to a civic, rather than merely commercial, agenda.

Possible Meanings of Changing Type Sizes

Larger type not only reduced the coverage on the front page but also tied the newspaper to particular ways of reading and groups of readers. The largest body type, a 12-point size called *primer*, is linked to juvenile readers. Conventional practice since the nineteenth century has connected primer type to school readers and picture books for children, even though research in the 1960s found that the smaller the child the smaller the legible type (Swann). The next largest body type, commonly referred to as "large print," is linked to older readers. Large-print bibles and "senior citizen" printed

ephemera have set the conventional significance of these type sizes. Small type, set 8 points or smaller, is linked to assiduous, devoted readers. It is used conventionally in the fine print of contracts and reference works. By shifting from fine print to large print, newspapers abandoned their visual role as a compendium, favoring instead the typographic dress of leisure and retirement. Except in classifieds and in business and sports statistics, the signs of the poring and culling aficionado of news were replaced by the signs of comfort and convenience that signify either the older or the casual, uncommitted reader.

Many other factors came to bear in this process. American publishers for some time have been aware that the U.S. population is aging (Bogart). Older readers take more time to read and are among the most loyal of newspaper subscribers. Enlarging the type seemed to serve an important, primary audience for the medium. Publishers have also recognized that larger type can help the bottom line. If fewer words can fit on a page, then fewer need be researched, written, typeset, and printed. Profit, however, was probably of secondary concern. Enlarging the type size seemed to provide a way of serving readers while simultaneously saving money. Everyone appeared to benefit. But publishers and legibility researchers made a fundamental miscalculation.

Adopting the visual signs of leisure activity and older readers aligned the medium with a narrowing audience. As leisure time declines, the newspaper-as-leisure must compete for readers' free time. A quick and easy design requires relaxed contents, not the hard stuff of documenting community life and assisting with the chores of adulthood and the duties of citizenship. Leisurely content in turn makes the newspaper optional, just another recreational outlet among many. The aging population might seem to promise some respite, but only temporarily. Newspapers cannot survive without a constant infusion of young readers, who are the least likely to adopt a form clearly marked with the signs of advancing age (Barnhurst and Wartella).

CONCLUSION

These consequences for the content of the newspaper and the meaning of its typographic form are only partly due to legibility science. The researchers were also participating in the style of their times. Pyke, who lived in an era that could not accept sans-serif type in text, disregarded his own finding that plain typefaces were more legible. When Tinker, who worked in a period enamored of all things large and spacious, found that 7-point type was just as legible as 8, he still called for larger sizes. Recent research on justified columns recommended setting type ragged, despite its own findings that neither justified nor ragged type had significantly better legibility. These recommendations spring not strictly from the data but in no small measure from the prevailing visual style. A concern for content and for consequences might have led newspapers in quite a different direction, perhaps to smaller, sans-serif body type.

Science influenced the changes in newspapers in many other ways during the twentieth century shift to modernism. In typography, the field of study called congeniality research attempted to find an empirical guide to choosing typefaces

that conveyed certain emotional connotations (Ovink). During the sixties, the science of proxemics seemed to provide evidence that a more-open, spacious layout was more democratic (Hall). Other ideas, such as the principles of design commonly included in newspaper design textbooks, acquired a quasi-scientific status or claimed the status as universal laws by tracing a genealogy back to the Greek philosophers (Barnhurst, forthcoming). Designers succeeded in harnessing science to give authority to visual decisions, and newspapers have, for the most part, adopted modern design. The larger typography, pictures, and simplified layouts have reduced the number of stories and items on the page and introduced more space. On the whole, newspapers can be said to have become more legible and more aesthetically designed because of these changes.

But in all of these cases, the application of science to newspaper design has had unintended consequences. Minorities and other cultural groups now seek more coverage, but less can be covered on a front page that displays fewer, larger (if more beautiful and more legible) items. Minorities have difficulty winning a larger share of what has been a shrinking pie.

Legibility along with other areas of scientific investigation and so-called philosophical principles are widely used in the field of visual literacy. They provide valuable guidance for beginners but also require some caution. At times, compromising legibility and beauty may serve a greater number of readers and allow more diversity of content.

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